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The influence of operating conditions on the filtration behavior of actual extracellular polymeric substances (EPS) using dead-end membrane filtration cell

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ABSTRACT

The EPS solution extracted from the activated sludge of sequencing batch reactors (SBRs) by the formaldehyde–NaOH extraction method was filtered in dead-end cell with 0.1 μm PVDF microfiltration membrane under various operating conditions, and the filtration behaviors of actual EPS solution were investigated. The experimental results show that: firstly, the membrane filtration mechanism is governed by cake filtration, and the cake is compressible; secondly, the cake specific resistance increased with the increase of transmembrane pressure (TMP) and decreased as the concentration increased; thirdly, all operating conditions had a significant influence on the cumulative filtrate volume (CFV) of actual EPS solution; finally, the CFV increased with the rise of temperature and TMP, but decreased as EPS concentration increased. The sequence of influence degree of operating conditions is the temperature (38.1%) > the TMP (34.8%) > the EPS concentration (27.1%). A quantitative regression relationship between the CFV and the temperature (T), TMP (ΔP) and EPS concentration (C) was obtained as follows:

$$\mathrm{CFV} = -3.7\times10^{-8}C + 5.79\times10^{-7}T + 1.27\times10^{-4}\Delta P$$

Keywords: Microfiltration; Dead-end; Cumulative filtrate volume; Regression method; Actual EPS solution; Influence degree

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